

Claims

Having described the invention, the following is claimed:

- 1 1. A surface acoustic wave device including a transducer electrode
2 formed on a substrate, the electrode having a plurality of layers, and at least one of the
3 layers being metal and another of the layers being a material for providing a hardening
4 effect to the metal layer.
- 1 2. A surface acoustic wave device as set forth in claim 1, wherein the
2 material is a metal and oxygen compound.
- 1 3. A surface acoustic wave device as set forth in claim 2, wherein the
2 metal and oxygen compound includes aluminum.
- 1 4. A surface acoustic wave device as set forth in claim 3, wherein the
2 metal and oxygen compound is aluminum oxide.
- 1 5. A surface acoustic wave device as set forth in claim 1, wherein the
2 metal of the material includes aluminum.
- 1 6. A surface acoustic wave device as set forth in claim 1, wherein the
2 substrate is planar, each of the layers having a portion extending parallel to the
3 substrate, the parallel extending portions being vertically stacked relative to the
4 substrate, at least some of the layers also having portions extending transversely to the
5 substrate, and the transverse extending portions being laterally stacked relative to the
6 substrate.
- 1 7. A surface acoustic wave device as set forth in claim 6, wherein the
2 second layer, of hardening material, has a portion extending laterally about the first
3 layer, of metal, for preventing migration of the metal.

1 8. A surface acoustic wave device as set forth in claim 6, wherein the
2 transverse portions do not extend onto the substrate beyond the electrode.

1 9. A surface acoustic wave devices as set forth in claim 6, wherein the
2 material is a metal and oxygen compound.

1 10. A surface acoustic wave device as set forth in claim 9, wherein the
2 metal and oxygen compound includes aluminum.

1 11. A surface acoustic wave device as set forth in claim 10, wherein the
2 metal and oxygen compound is aluminum oxide.

1 12. A surface acoustic wave device as set forth in claim 6, wherein the
2 metal of the material includes aluminum.

1 13. A surface acoustic wave device as set forth in claim 1, wherein the
2 transducer electrode is electrically connected to a metal component that permits
3 electrical connection of the surface acoustic wave device to an electrical device
4 external to the surface acoustic wave device, the electrode having a metal portion of a
5 first metallization, and the component being of a second, different metallization.

1 14. A surface acoustic wave device as set forth in claim 13, wherein the
2 component includes a one of a bus bar and a bond pad.

1 15. A surface acoustic wave device as set forth in claim 13, wherein the
2 first metallization includes the metal portion of the electrode being made of a first
3 metal, and the second metallization includes the component being made of a second,
4 different metal.

1 16. A surface acoustic wave device as set forth in claim 13, wherein the
2 first metallization includes the metal portion of the electrode having a first thickness,
3 and the second metallization includes the component having a second, different
4 thickness.

1 17. A surface acoustic wave device including a transducer electrode
2 formed on a substrate, the electrode having a plurality of layers, and at least one of the
3 layers being metal and another of the layers being a metal and oxygen compound.

1 18. A surface acoustic wave device as set forth in claim 17, wherein the
2 metal and oxygen compound includes aluminum.

1 19. A surface acoustic wave device as set forth in claim 18, wherein the
2 metal and oxygen compound is aluminum oxide.

1 20. A method of making a surface acoustic wave device, the method
2 including the steps of:
3 providing a substrate; and
4 creating a transducer electrode having a plurality of layers on the
5 substrate, including creating a metal layer and creating a layer of a material that
6 provides a hardening effect to the metal layer.

1 21. A method of making a surface acoustic wave device as set forth in
2 claim 20, wherein the step of creating a layer of a material includes creating the layer
3 of material as a metal and oxygen compound layer.

1 22. A method of making a surface acoustic wave device as set forth in
2 claim 20, wherein the step of creating a transducer electrode includes metal lift-off
3 processing.

1 23. A surface acoustic wave device including a transducer electrode
2 electrically connected to a metal component that permits electrical connection of the
3 surface acoustic wave device to an electrical device external to the surface acoustic
4 wave device, the electrode having a metal portion of a first metallization, and the
5 component being of a second, different metallization.

1 24. A surface acoustic wave device as set forth in claim 23, wherein the
2 component includes one of a bus bar and a bond pad.

1 25. A surface acoustic wave device as set forth in claim 23, wherein the
2 first metallization includes the metal portion of the electrode being made of a first
3 metal, and the second metallization includes the component being made of a second,
4 different metal.

1 26. A surface acoustic wave device as set forth in claim 23, wherein the
2 first metallization includes the metal portion of the electrode having a first thickness,
3 and the second metallization includes the component having a second, different
4 thickness.

1 27. A surface acoustic wave device as set forth in claim 23, wherein the
2 electrode has a plurality of layers, and at least one of one of the layers being metal and
3 another of the layers being a material for providing a hardening effect to the metal
4 layer.

1 28. A surface acoustic wave device as set forth in claim 27, wherein the
2 material is a metal and oxygen compound.

1 29. A surface acoustic wave device as set forth in claim 28, wherein the
2 metal and oxygen compound includes aluminum.

1 30. A surface acoustic wave device as set forth in claim 29, wherein the
2 metal and oxygen compound is aluminum oxide.

1 31. A surface acoustic wave device as set forth in claim 27, wherein the
2 metal of the material includes aluminum.

1 32. A surface acoustic wave device as set forth in claim 27, wherein the
2 substrate is planar, each of the layers having a portion extending parallel to the
3 substrate, the parallel extending portions being vertically stacked relative to the
4 substrate, at least some of the layers also having portions extending transverse to the
5 substrate, and the transverse extending portions being laterally stacked relative to the
6 substrate.

1 33. A surface acoustic wave device as set forth in claim 32, wherein the
2 second layer, of hardening material, has a portion extending laterally about the first
3 layer, of metal, for preventing migration of the metal.

1 34. A surface acoustic wave device as set forth in claim 32, wherein the
2 transverse portions do not extend onto the substrate beyond the electrode.

1 35. A surface acoustic wave device as set forth in claim 32, wherein the
2 material is a metal and oxygen compound.

1 36. A surface acoustic wave device as set forth in claim 35, wherein the
2 metal and oxygen compound includes aluminum.

1 37. A surface acoustic wave device as set forth in claim 36, wherein the
2 metal and oxygen compound is aluminum oxide.

1 38. A surface acoustic wave device as set forth in claim 32, wherein the
2 metal of the material includes aluminum.

1 39. A surface acoustic wave device including a transducer electrode
2 electrically connected to a component that permits electrical connection of the surface
3 acoustic wave device to an electrical device external to the surface acoustic wave
4 device, the electrode having a metal portion made of a first metal, and the component
5 being made of a second, different metal.

1 40. A surface acoustic wave device including a transducer electrode
2 electrically connected to a component that permits electrical connection of the surface
3 acoustic wave device to an electrical device external to the surface acoustic wave
4 device, the electrode having a metal portion of a first thickness, and the component
5 being metal of a second, different thickness.

1 41. A method of making a surface acoustic wave device, the method
2 including the steps of:
3 making a transducer electrode, including making the electrode to have
4 a metal portion of a first metallization; and
5 making a metal component, electrically connected to the electrode, that
6 permits electrical connection of the surface acoustic wave device to an electrical
7 device external to the surface acoustic wave device, including making the component
8 of a second, different metallization.

1 42. A method of making a surface acoustic wave device as set forth in
2 claim 41, wherein the steps of making a transducer electrode and making a metal
3 component include metal lift-off processing.